National Park Service
U.S. Department of the Interior

Rocky Mountain National Park
Continental Divide Research Learning Center

Water Blitz

The Question: Does the park's water chemistry reveal patterns over space and time?

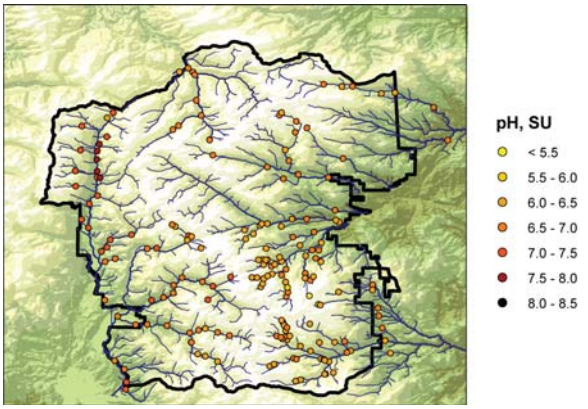
Water quality affects the distribution and abundance of aquatic organisms such as algae, aquatic invertebrates, and fish. The chemical composition (including the amount of dissolved carbon, nitrogen, and phosphorus) of stream water also affects the export of nutrients and other solutes to downstream ecosystems. Water chemistry reflects patterns of atmospheric deposition, mineral weathering, nutrient uptake, and human perturbations (or disturbance to natural systems). Because water quality is affected by processes operating at multiple geographic scales, even in pristine streams, understanding the controls on water quality is often complex and requires information on spatial patterns of water quality. Repeated analysis reveals changes over time.

The Project: Take a "snapshot" of water quality by colleting water from as many locations as possible in one day.

The team of National Park Service staff, volunteers, and researchers at the University of Colorado's Center for Limnology collected 185 stream and lake water samples on a single date in August 2008. At each location, they took photos of the stream channel, riparian zone, and stream bed, which provided information on channel morphology (the shape of the river and its bed) and riparian vegetation. Color-coded bands on bottles matched each sample number to a specific set of photos, and the bottle and a yellow measuring cord provided measures of scale in the photographs. They also cut clippings of dominant woody vegetation. Researchers transported all samples to the lab at the university that night. Dr. James McCutchan, Jr., led a team of scientists who analyzed the samples for a wide range of water quality parameters including pH, dissolved carbon, nitrogen, and phosphorus.

The Results: The analysis showed immediate spatial patterns in water chemistry.

Although sample analysis took almost a year to complete, certain patterns emerged. Geological influences drive patterns of pH and specific conductance (which is an indicator of water purity) with the highest values in the upper Colorado River drainage. Higher concentrations of nitrate-N in east-facing watersheds probably are related to patterns of atmospheric deposition (pollution). Wetlands affect the concentration of dissolved organic carbon, but it was also elevated in watersheds that burned in the last several decades. This project will improve our understanding of controls on water chemistry, contribute baseline data required to predict the effect of environmental change on stream ecosystems, and aid in the design of long-term monitoring programs in the Colorado Rockies and elsewhere.



Top: photos of six of the 185 locations sampled during the snap shot survey.
Bottom: A pattern of pH measures emerged during analysis.

This summary is based on published, peer-reviewed and/or unpublished reports available at the time of writing. It is not intended as a statement of park policy or as a definitive account of research results.
For more information on the park's research program, see www.nps.gov/romo
Written by: James McCutchan, Jr. Date: March 2009 Updated: June 2009 Photo credit: NPS-RMNP and CU-Boulder; graphic by CU-Boulder